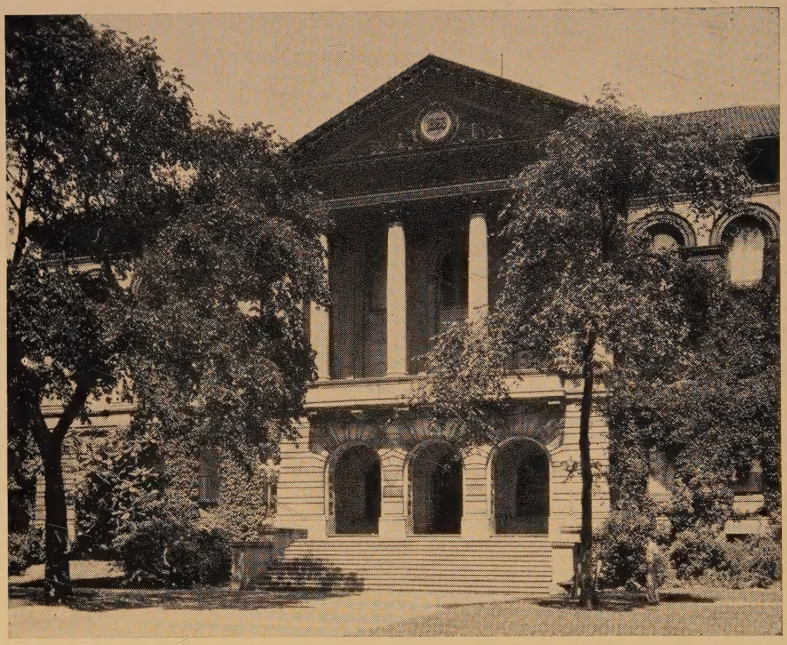
The CHICAGO NATURALIST

Published by

THE CHICAGO ACADEMY OF SCIENCES

VOL. 7 · NO. 2 ❖ ❖ ❖ JUNE · 1944



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The Chicago Naturalist

Published four times a year by
THE CHICAGO ACADEMY OF SCIENCES
Lincoln Park · Clark Street and Ogden Avenue
CHICAGO 14, ILLINOIS

VOLUME 7 JUNE, 1944 NUMBER 2

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The cotton-wood poplar, *Populus deltoides,* at the period of leaf fall. The males shed many of their leaves before the female trees begin to shed. September 29, 1940.

The Inflorescences of the Cotton-wood Poplar

David Heizmann and Charles A. Shull

The Cotton-wood poplar, *Populus deltoides,* is often planted along the streets of new subdivisions because of its rapid growth, and it persists until it is replaced by more desirable trees. Its shortcomings are a tendency to lose its leaves during summer when the soil is dry, and to lose them early in the fall, before other trees begin leaf-fall.

The tree is very interesting to keen students of natural history because of the differences in behavior of the two sexes. The poplar is dioecious, some trees being males, and others females. The males are precocious, and can very readily be distinguished from the females by observing their behavior during the winter, spring, and fall. In early November it is very difficult to tell them apart, but as early as the beginning of December, the buds of the male trees become swollen, and go through the winter enlarged; those of the female remain tightly closed and unswollen all through the winter.

The first sign of tree life in the spring is noted on the elms. As the buds of the elm break forth from their covering, the large, sticky buds which occur irregularly near the terminal ends of the branches of the cottonwood poplar resume their swelling, gradually split open, and uncover the staminate catkins. The female trees, whose buds enclose the pistillate catkins, do not show signs of awakening until a couple of weeks later, after the staminate catkins have been shed. Figure 1, taken from the branches of a male and a female tree on March 28, 1937, shows the difference of the two sexes late in March. If you have wondered why some trees strew the sidewalks with catkins, while others stand inactive, it is most probable that the trees differ in sex, for the females lag behind the males sometimes from one to two weeks, and do not shed the female catkins until after the seeds are ripe, in June.

The exact time that the male catkins appear depends to a considerable degree upon temperature. In early springs they may come early in March, in late springs not until well along in April.

By the time the female trees bear the pistillate catkins, the male catkins have all been shed, and the male trees are in leaf. Figure 2 shows the branch of a female tree with catkins, and of a male tree with leaves. These were collected from trees standing near each other, and were photographed on April 19, 1938. It is obvious that the pistillate catkins do not appear until after the staminate clusters have been shed. Yet the pistillate flowers always seem to be fertilized. The pollen from the staminate flowers is very light, and is probably blown about by the wind for a considerable time after the male catkins fall.

The female catkins resemble a string of small green beads, or bells, the whole inflorescence being about 9 cm. in length. At first the clusters are short, but they soon grow to full size, and the bells open enough to allow the pollen to be caught. After fertilization takes place, the bells increase in size, and finally burst open usually sometime in

Fig. 1. Male branch of *Populus* to left, female to right. Conditions seen in March or April, when males first become active. March 28, 1937.

June. Then the seeds are shed and float down to the ground, borne by a pappus, or parachute, made of fine white hairs. Sometimes they float in the wind for days, and form conspicuous masses of white, cotton-like debris along the sidewalks. The seeds are small and white, about 2 mm. long and ½ mm. wide. They are short-lived, and must find germinative conditions quickly, or they lose their vitality completely.

In a few days after the seeds have been shed, the female catkins fall from the trees. During the season of 1944 the female trees began to leaf out during the first week in May. On May 15 the half-grown foliage did not yet conceal the female catkins from view.

There is no visible difference in the size of leaves on male and female trees. The maximum length of leaves is about 17 cm., and the width about 14 cm. In the fall of the year the males feel the approach of autumn sooner than the females, and begin to drop their leaves

Fig. 2. Female branch to left, male to right. The male catkins are shed before the branches leaf out, and the female inflorescences first appear when the males are in leaf. April 19, 1938.

earlier. The frontispiece shows a row of four trees, a female tree in full leaf near the left of the photograph, with a male tree to the extreme left, and two to the right. These were photographed on September 29, 1940, by the late Professor Charles J. Chamberlain of the Department of Botany, University of Chicago. The trees stand between the Men's Building of the University of Chicago and 61st Street. They have been observed year after year, and always show this difference in leaf-fall. the actual time of fall depending on the climatic conditions; cool temperatures and rains favor early fall, if the rains do not come too soon.

Loose-Lipped Fishes

THEODORE H. EATON, JR.
Illustrations by the author

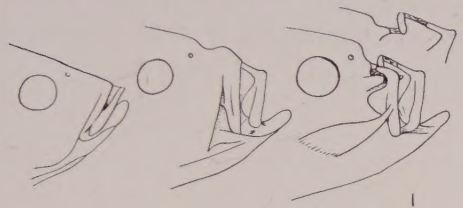
If you have ever watched a goldfish closely you have seen it continually opening and shutting its mouth, and each time the upper lip moved out and back again. Occasionally the fish would stretch its mouth to its fullest extent, making almost a funnel, and then jerk the lips back with something like a self-satisfied expression on its face.

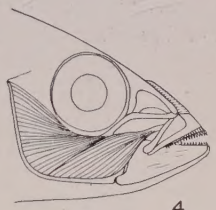
It is curious that certain fishes have developed this complex device of joints and muscles, by which their upper jaws are often more freely movable than the lower. The accompanying drawing shows what is involved, in the goldfish's mouth (Fig. 1). While there is always a large muscle going down the side of the face (not shown) to attach to the lower jaw and move it, just as in ourselves, there is also a muscle running forward, as shown, to one of the upper jaw bones, the maxilla, which pivots on the side of the nose. Then the upper lip is formed by another piece, the premaxillary, shaped like an arch. It has, on top, a little ligament or cord which fastens it to the skull and limits the distance to which it can be drawn out. The act of "pushing out" the lip is actually accomplished by pulling, for at each corner of the mouth the upper jaw bones attach by short cords to the lower jaw, and so are drawn forward whenever the lower jaw drops open.

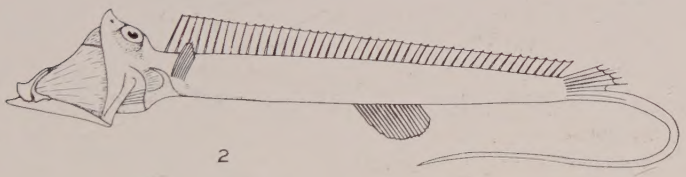
Now let us look at one of the most remarkable fish mouths in existence (Fig. 2). It is found in a rare Atlantic fish, which for want of a better name we may call a ribbon fish, or, scientifically, *Stylophorus*. This unfortunate creature has practically to break its neck every time it takes a mouthful of food. The upper part of the head jerks back and the mouth, carried at the end of an enormously lengthened jaw, shoots far forward. The upper jaw bones, much reduced in size, go out with it, and the space left behind is covered only by skin. Thus there is created suddenly a partial vacuum inside the head, which irresistibly sucks in any small object just in front of the mouth; at least, so we may judge from the little that is known of the anatomy of *Stylophorus*.

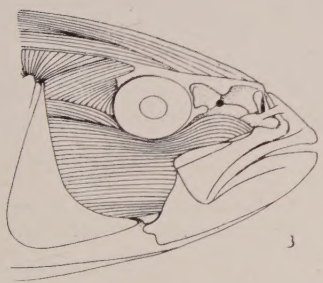
The third figure shows the head of a yellowtail, caught off the coast of southern California. It is a distant relative of the tuna, and even more beautiful in color and streamlined form. Also it was the best fish the writer ever ate, although a barracuda caught at the same time ran it a close second. Here we find that the strong muscle attached to the lower jaw sends an extension of itself up and forward to insert on the maxillary, or rather on a tendon fastened to that bone. The premaxillary, gracefully curved to fit the curve of the mouth, has only a slight freedom of movement.

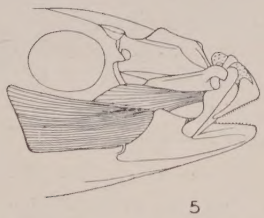
In the stickleback (Fig. 4), a familiar little fish of the eastern states, all the bones are delicate and thin. There is a distinctly separate outer portion of the jaw muscle that reaches to the slender maxillary bone. The premaxillary bears a long spine that fits in a groove on top of the snout, extending almost as far back as the eyes when the mouth is shut.











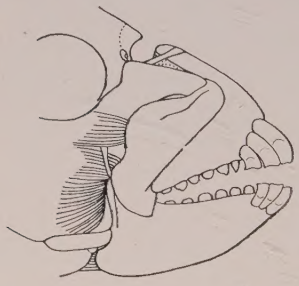
1 - Goldfish, *Carassius auratus.*
2 - A ribbon fish, *Stylophorus chordatus.*
3 - Yellowtail, *Seriola dorsalis.*
4 - Stickleback, *Eucalia inconstans.*
5 - Pirate perch, *Percopsis omiscomaycus.*

The pirate-perch (Fig. 5), also in eastern fresh waters, illustrates a different arrangement of muscles, accomplishing the same action as before but in a contrasting way.

The sheepshead of the Atlantic coast (Fig. 6) is notable for its almost human front teeth, followed by blunt molars. The jaws are

powerfully built for nipping and grinding, yet essentially the same arrangement of bones is shown here as in most of the others, and the upper jaw is nearly as movable as the lower.

We shall glance at one more among the thousands of "ordinary" kinds of fish, but by now it is abundantly clear that there are very few ordinary fishes. Most of them, like this "sea-robin" from Hawaii (Fig. 7) have in their make-up at least a few outlandish features. The sea-robin is partly encased in armor, and its name comes from



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7

8

6 - Sheepshead, *Archosargus probatocephalus.* 7 - Sea-robin, *Lepidotrigla japonica.*
8 - A cichlid, *Petenia splendida,* from Guatemala. This figure reprinted with permission from the *Journal of Morphology,* vol. 72, no. 1, 1943.

the much enlarged wing-like pectoral fins, rather than from any resemblance to a robin in its face! Again we find bones and muscles corresponding to the other types, yet quite unlike them in details.

To conclude this sketch of protrusible fish mouths we show one of the most bizarre of all, a perch-like fish, *Petenia,* from a lake in Guatemala (Fig. 8),—perch-like, that is, in all but its jaws. The mouth is very large, well equipped with teeth, and the lower jaw is remarkably long. But the most surprising feature is the immense spine

reaching up and back past the eyes, from the upper jaw. This spine slides in a groove in the skull, just under the skin, and its extreme length is a measure of the distance to which *Petenia* is able to shoot out its mouth after prey. It is a predatory fish, catching other kinds, and the mechanism of its jaws seems to approach the limit of efficiency.

It looks, then, as if the great majority of fishes must have some apparatus that pushes or pulls out their upper jaws. Except for the sharks, rays, and a few other primitive groups, this is true. The bony fishes have, among themselves, originated this device, but whether once or several times is not yet clear. If we look at the older families of bony fishes, such as the herrings and smelts, salmon, catfish, and eels, we find in them no protraction of the lips. Although the corresponding bones and muscles are present, they do not work in this way. Sometimes the upper jaw seems loose, as in herring or pike, but no muscles act on it. In these older types it is clear that the jaws are in a more primitive condition, so that they have never attained to the sophisticated level of lip-wigglers.

On the other hand, the lip-wiggling idea, once it "took hold," did not even then maintain itself among all the higher families that tried it. One familiar example among several may be given, the tribe of swordfish, marlin and sailfish. These swift and streamlined heavyweights of the open sea are specialized offshoots of what we may call the mackerel clan. Among the latter the upper jaws are still mobile, or have barely ceased to be, while the former, with great spears extending forward from their upper jaws, cannot afford to have the slightest weakness in the support of these weapons. An armored knight in a tournament would not have lasted long with a double-jointed lance! So we find evidence here of an older mobility of the jaw replaced by solid fusion of the "sword" and skull bones into a structure that withstands the stress of swinging violently from side to side in the water, or the concussion of a head-on blow delivered at top speed.

Many ticklish problems of relationships are involved in studying fish jaws, many uncertainties about the origin of each particular kind. But the gaps will in some cases be filled by examining more types, and in time a fairly accurate picture of this odd mechanical device, with its countless different variations, may be available.

The Herbarium of The Chicago Academy of Sciences

Anna Pedersen Kummer[1]

Over two years have elapsed since the beginning of the present volunteer effort to sort the scattered and neglected herbarium resources of the Museum. Only a small fraction is available for study at the present time. Nevertheless, our director feels (and this writer agrees) that some accounting should be given now while the history and ramifications of the collection are fresh before us.

We are happy in the possession of many rare specimens from the Chicago region, the area to which the Academy is especially dedicated. The nature of the early history of Chicago accounts perhaps for the paucity of specimens of that time. The early inhabitants were not insensible to the natural history about them. Rather, as Mrs. Atwater wrote to a friend in 1876, they had "few idle moments . . . . In a city like Chicago, one can never fold his hands in idleness without violating the injunction to 'love your neighbor as yourself.' "[2]

Margaretta Clark left an album of flowers "collected on the Chicago Prairies in 1838," but many specimens are garden flowers, others from the eastern seaboard, and all without definite data. Hence it is impossible to assign any of them conclusively to the Chicago area. Dr. Franklin Scammon, one-time president of the Academy, retired from business in 1852 and devoted his time to botanical collections. In 1864, he transferred to the Academy his herbarium of the Flora of the Lake Basin and Prairies. A fire in 1866 destroyed specimens of the northern Pacific expedition. Dr. Scammon's collection of 6000 species was spared only to be destroyed in the holocaust of 1871, together with plants from the Western Union expedition and some of Professor Babcock's collection.

Forunately, two important herbaria survived the fire. Other scientific collections that Elizabeth Emerson (Mrs. Samuel T.) Atwater had in the Academy were lost, her pressed plants were stored elsewhere. She collected some 3000 specimens from 1856 to 1876, many sent her by friends traveling abroad, some plucked here and many more accumulated by her own prodigious activities while traveling in the United States. Mosses were her particular interest. She modestly attached certain identification only to those specimens determined by authorities of the day, particularly G. W. Clinton, through whom she obtained exchange material from Gillman, Gray, and others. In 1876, she wrote "since fearful effects of fire . . . [I] have abandoned idea of delaying plants for printed labels or a systematic arrangement . . . particular

[1]Honorary Curator, Systematic Botany.

[2]Memorial Sketch of Elizabeth Emerson Atwater written by her Friends—Mary Clemmer, Courier Co., Printers, 1879.

in appending dates though in a very informal way." In 1879, the year after her death, Mr. Atwater deposited in the Museum the thirty boxes of herbarium specimens she had prepared for it. With true feminine eclecticism she had pinned, folded, and even basted her beautifully pressed specimens on whatever came to hand—a Guide to Chicago, a dodger of the Sanitary Commission Fair, or the wrapping paper from a fashionable store! Her collection is probably the earliest authenticated material of the Chicago region. She obtained *Liatris* species from Hyde Park (6 miles south of Chicago) in 1856, plucked *Cypripedium* species there in 1858. She has left us apple and garden red cherry blossoms from Judge Skinner's garden, corner of Wabash Avenue and Madison Street, dated 1869. There is an *Adiantum* frond fully eighteen inches across gathered in Lake Forest in 1866. Much of her collection had not been disturbed in the intervening seventy years.

The second early collection made in the 1870's is that of Henry Homer Babcock who came to Chicago after the Civil War. Each specimen is beautifully pressed, labeled and ready for mounting, the work of a careful and scholarly botanist. There are some one thousand species, about half of them exchanges from Bebb, Seamans, Vasey, and others in this country, and Lewis and Van Heurck abroad. Apparently Babcock made every botanical excursion possible by railroad in the Chicago region, assembling some 500 species. He found white lady's slipper in Hyde Park as late as 1871. Nothing indicates when or how the collection came to the Academy. It is reasonable to suppose that while he was its president he gave to it what he had been able to salvage from his monumental labors in the abandoned South Park Botanic Garden.

When the Academy was obliged to give up its Wabash Avenue residence in 1886, collections were taken to the Interstate Exhibition building then in Lake Front Park. The unmounted and inaccessible condition of the herbarium was probably its best protection during this interim of vicissitudes until the present building was opened in 1894.

Mrs. Atwater was the forerunner and Dr. Babcock the beginning of the "golden age" of botanical collecting and study memorialized by Dr. Pepoon in his *Flora of the Chicago Region* (1927). However, it was not until the 1890's that the Academy was again able to take its part. In 1895, Mrs. Agnes Chase interested herself and others in the collections. Since there was no equipment, she got up a subscription list, and, with the money, ordered built two sturdy oak herbarium cases. In her spare time she arranged Babcock's collection, mounted many of the specimens and had the labels lettered directly upon the sheet. She sorted a part of Mrs. Atwater's collection before she went to the U. S. National Museum in 1903 and made a gift of fifty of her own speci-

mens. Meanwhile, Professor L. M. Umback gave 1100 specimens in 1897; W. S. Moffatt 1096 Chicago plants in 1895, and E. J. Hill 150 specimens in 1898. Baron Von Mueller sent 25 plants from Australia in 1895 and Virginius Chase presented 250 Illinois plants particularly well pressed. Jay B. Ambrose gave 250 plants collected at Northwestern University in 1888.

After Mrs. Chase's departure a large and carefully systematized collection with German labels but without collection data was received. J. R. Putnam gave a similar collection without data and in folio form. In 1909 Miss Carrie Reynolds of Lake View High School volunteered considerable assistance and secured more herbarium cases. At that time Dr. E. L. Moseley brought a splendid Ohio collection to the Academy in an exchange arrangement.

But the work laid out by Mrs. Chase was still unfinished. From 1912 to 1914, Miss Elizabeth Tuttle mounted much of the Umbach, Moffat, and Babcock collections; unfortunately she sometimes mounted two or three unrelated species on a single sheet. In 1930, Mr. C. A. Buhl reopened the work, mounting many specimens of the Atwater and German collections.

Except for Mrs. Chase's thorough work, no attempt seems to have been made to check identifications. Mr. Buhl corrected only the synonymy in the mounted specimens. Apparently insects have been the sole visitors of the unmounted specimens over the years. Babcock's *Smilacina bifolia* has been lying serenely undisturbed for seventy years.

Much excellent material has been discovered in this most recent attempt at good housekeeping. As to the arrangement of the material, there seems to have been shifts of opinion over the years. Dr. Babcock and Mrs. Chase probably accepted the area covered by the older manuals of Gray as basic. Buhl strived for a cosmopolitan collection. Just now we feel that all else can wait until we have the unmounted three-fourths of our Chicago region material in order. We would like to be able to turn at once to the *Galinsoga* that Moffatt collected in 1891 at the old Exposition building and labeled "rare," or the *Myosotis* that Babcock found "abundant" in Riverside. Meantime, all other material has been sorted according to its geography, treated with insecticide, and wrapped securely.

One more misfortune has been added to the visitations upon the collections of fire, expositions, dust, and neglect. Because the fourth floor of the Museum is cold in winter and scorching in summer, it seemed a happy solution to use the northeast basement room for botany. Nothing untoward happened to specimens left there for two years and the collections were accordingly transferred. The elements seemed to be awaiting this for they immediately assumed the proportions proper

for rapid and devastating development of fungus. Only the ferns and some poisoned specimens escaped some trace of taint before they could be moved again.

This report comes, then, in the midst of setting our house in order. When once we have our material from the Chicago region ready, we hope that authorities on various families will bring their talents for a house-warming. Mrs. Chase has already volunteered to check the grasses. We wish to make this important and historical collection usable and also to provide for its enlargement.

Test Your Nature Lore

1. A Mayfly ghost is a dead Mayfly. (True, False)
2. Which one of these aquatic insects is *not* a true fly (Order Diptera) ?
   (a) crane fly (c) caddis fly
   (b) mosquito (d) midge
3. Water beetles carry a reserve air supply under their wing covers. (True, False)
4. Is it the common mosquito or the malarial mosquito that characteristically rests "standing on its head"?
5. Mosquito larvae rest upside-down at the surface of the water in order to:
   (a) catch microscopic animals floating near the surface.
   (b) breath air through caudal tubes.
6. The worm-like caddis fly larva builds a protective case. (True, False)
7. All Odonata (dragonflies, including the so-called damselflies) rest with their wings held horizontally. (True, False)
8. Which one of these groups of aquatic insects does not have a pupal stage in its life cycle?
   (a) water beetles (b) water bugs (c) water flies

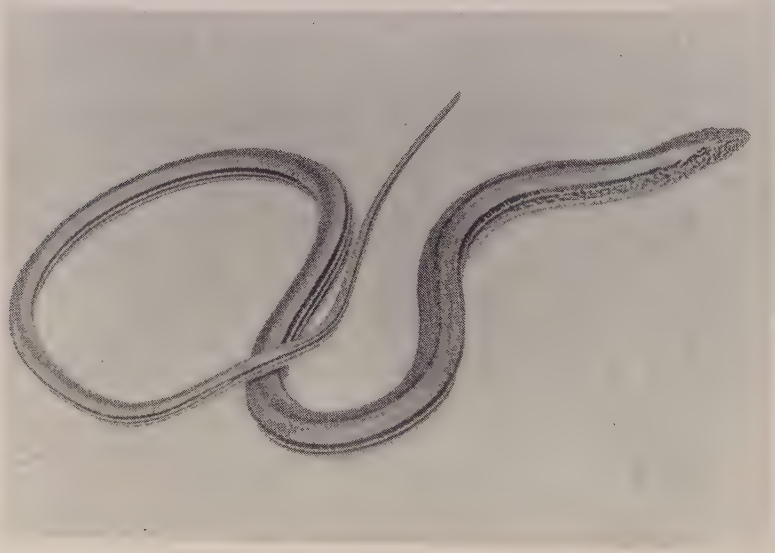
Answers on page 41.

The Glass-Snake

John Edwin Coe

The location of a colony of legless lizards, often called glass-or joint-snakes, in the sand dunes northeast of Gary, Indiana, has been known for many years. Brennan in *Wonders of the Dunes*, 1923, reports "Dr. Herman Pepoon, the botanist, discovered two of these about five years ago at Dune Park and one at Miller. Mr. Frank Woodruff of the Chicago Academy of Sciences found one at Mineral Springs in May, 1918. Mr. Arthur Patterson, the game warden at East Gary, Indiana, has seen a number of them." The recent discovery of another specimen in the area is the occasion for this article. Comparison has been made with Pepoon's specimens now in the museum at Lake View High School.

The glass-snake *(Ophisaurus ventralis)* belongs to the family Anguidae and is related to the European "blind-worm" or "slow-worm" *(Anguis fragilis)* often exhibited in American zoos. Its geographic range is the southern United States, south of the Ohio River in the east, but



A "glass-snake" with a normal, uninjured tail. Photo by H. K. Gloyd.

extending north to the Chicago Region in Indiana and Illinois and to Wisconsin; in the west to Kansas, Oklahoma, and Texas.

This legless lizard may be distinguished from the snakes by its movable, scale-covered eyelids, which frequently blink, and by the presence

This one's tail broke off—"unjointed"—close to the body. Photo by E. V. Komarek.

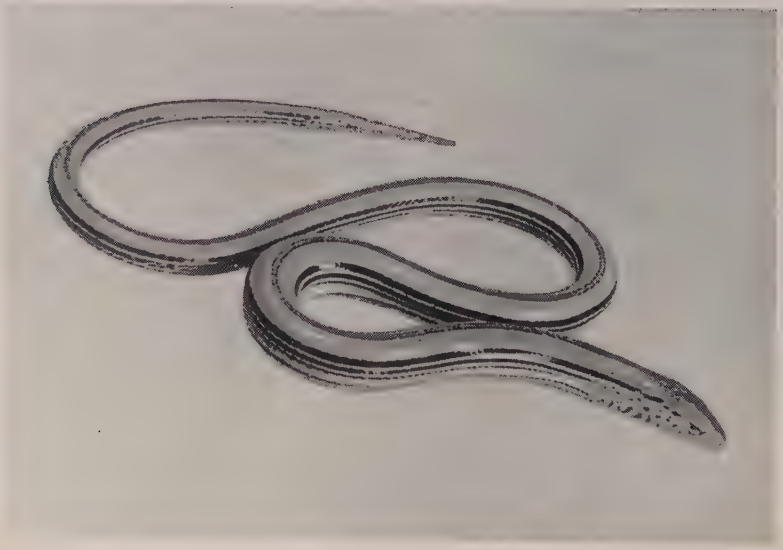
of external openings to the ears, longitudinally elongated cavities on the sides of the head in line with the mouth. The small ventral scales also distinguish these lizards from most snakes.

An adult glass snake is from 15 to 30 inches long. It has a rather heavy body and a long, thin tail somewhat more than twice as long as the body. Both body and tail are covered beneath the epidermis with twenty-six longitudinal rows of small, imbricated, rectangular, bony plates. There are about 120 vertical rows of plates from head to tail. The dorsal and lateral plates are separated from the ten rows of ventral plates by lateral grooves which are overlapped by the lower plates. These grooves are covered by soft, elastic bands, which extend to the vent and allow the body to expand when breathing.

There is considerable variation in color, the general background being a brownish olive. Our specimens have a brownish stripe down the middle of the back with three brownish stripes (blackish in older speci-

mens) on the sides and two stripes below the groove. The ventral plates are small, whitish with a yellowish green tinge. There are eight slightly larger preanal scales. The scales of the tail are arranged in whorls or bony rings. The sides of the head are marked by numerous blackish dots. The snout is long and tapers to a rounded tip. The interparietal, a pentagonal plate on the top of the head back of the large, broad frontal plate, is marked by a small, whitish spot, called a pineal eye, the vestige of a primitive sense organ.

Its lateral undulations are stiff and clumsy, and it throws its body sidewise instead of gliding like a snake. When held in the hand, its body



A "glass-snake" with tip of the tail regenerated. Photo by H. K. Gloyd.

feels hard and smooth and it creaks as the plates rub together. It attempts to escape by twisting its muscular, smooth body over and over. This is undoubtedly associated with its power of disengaging itself from its tail by a single twist when held by that organ. The detached tail threshes about vigorously for several minutes. The wound does not bleed and is quickly healed by the growth of a sharp-pointed spur which has, internally, a cartilaginous rod developed from the last vertebra. The scales covering the new tail are very small, rhombic shaped, and have a uniform olive color. This is the origin of the story of pioneer days of the "snake" that would fly to pieces when struck. That it can ever recombine with the separated tail has never been verified.

The internal structure has several peculiarities. A papilla-covered tongue protrudes from a sheath set well forward between the lower jaws. It is short, black-colored at the tip, and has only a shallow groove. It is frequently thrust out with a quivering motion. The jaws are armed with several rows of small, simple, conical, back-pointing teeth. Patches of teeth are present on the pterygoids, palatines and vomers of the upper palate. The lower jaws are fastened firmly at the front and articulated in such a way that the mouth can be opened only a short distance. This makes its seizing of prey quite awkward. The left lung is much reduced in size and the left lobe of the liver is missing. The pelvic arch is represented by lateral plates to which are attached short cartilaginous rods. The scapular arch has bony clavicles and coracoids and cartilaginous scapulas. An interclavicle is present. The ribs are not fastened to the cartilaginous sternum.

The glass-snake lives in dry, sandy soils where it spends much of its time underground. It feeds on insects, snails, spiders and earthworms. In captivity it quickly becomes tame and learns to feed on earthworms taken from the hand.

Test Your Nature Lore

Answers to questions on page 37.

1. False. The mayfly nymph is the only insect which molts once more after attaining functional wings, and this last skin to be discarded ("ghost") is almost literally the disembodied shadow of the emerged adult.
2. (c). The caddis fly has four functional wings while true flies have only two. It is, indeed, doubly misnamed as it looks more like a moth anyway.
3. True. All beetles are air-breathers, and this adjustment enables the water species to remain submerged for some time.
4. The malarial mosquito, *Anopheles*. The common mosquito, *Culex*, stands with its body nearly parallel to the surface.
5. (b). Most mosquito "wrigglers" are vegetarians. All are air-breathers, a habit which is taken advantage of in the method of mosquito control by pouring an oil film over ponds used for breeding.
6. True. The distinctive case of each species furnishes an easier means of identification than does the larva itself.
7. False. Most damselflies (suborder Zygoptera) rest with wings held vertically while dragonflies (suborder Anisoptera) hold their wings horizontally while at rest.
8. (b). The water bugs have a 3-cycle or incomplete metamorphosis, the larval and pupal stages being replaced by a gradual series of changes each time the nymph molts.

Museum Activities

Nature Hobbies Exhibit

The current exhibit in the museum lobby summarizes the nature interests and activities of the seven societies affiliated or associated with the Academy: Illinois Audubon Society, Wm. I. Lyon Bird-banding Council, Marquette Geologists Association, Amateur Herpetologists Club of Chicago, Chicago Entomological Society, State Microscopical Society of Illinois, and the Cowles Botanical Society.

The amateur's viewpoint is stressed—accessibility of collecting grounds (Chicago Region specimens), inexpensive or home-made equipment, the appeal of various manual skills developed in connection with each of the nature hobbies. Representative samplings from the collections of members, equipment for collecting, methods of preparing specimens, publications, and the like are shown. Particularly beautiful are the series of gem stones cut and polished in the Chicago Park District's lapidary shops, mounted insects and plants, and fossil ferns from the northern Illinois coal beds.

Dr. Graham's Book on Mushrooms now Ready

An event of interest to naturalists of the Middle West is the publication in June of Dr. V. O. Graham's "Mushrooms of the Great Lakes Region," a manual of the fleshy, leathery, and woody fungi of Illinois, Indiana, Ohio, and the southern half of Wisconsin and of Michigan. More than 1200 species of Ascomycetes and Basidiomycetes are described with keys for identification, and their habitats and geographic distribution stated. Poisonous species and those of known edibility are indicated. Descriptive terms are defined in a glossary and scientific names, including synonyms, are indexed.

It is illustrated by 868 figures in 49 plates, carefully drawn under the supervision of the author, and handsomely printed by collotype.

The manuscript was orginally prepared for publication in the *Botanical Series* of the Chicago Natural History Museum (formerly Field Museum), and was edited by members of the department of botany at that institution. The drawings for the plates were made by employees of the Works Progress Administration and the plates printed in the collotype plant of the museum. When it was found that the printing of the text by the Chicago Natural History Museum could not be accomplished without long delay, a plan for joint publication by that museum and the Academy was arranged. The necessary work that remained to complete the book was assumed by the Academy and the volume appears as Number Five in the Academy's series of *Special Publications*. Copies may be purchased ($4.10, postpaid) from the Academy and the Book Shop of the Chicago Natural History Museum.

Cowles Botanical Society

For its May meeting the Cowles Botanical Society sponsored a tour of Lincoln Park Conservatory. The group was conducted by Arthur Jackson of the Chicago Park District, who described floricultural methods, procedures, and problems and identified new and exotic species as they were encountered in each of the specialized greenhouses and show rooms. Following the tour a picnic supper in Lincoln Park was enjoyed by members and friends. The next meeting will be held in October.

Academy's Constitution Changed

At the Annual Meeting of the Academy, April 10, 1944, several important amendments to the Constitution and By-Laws of the Academy were adopted. The principal changes involve classification of memberships (Article III), constitution of the Board of Trustees (Article IV), duties of officers (Article V), and changes in By-Laws concerning the date of the Annual Meeting and provision for members to vote by proxy.

A printed copy of the Constitution and By-Laws, as amended, has been mailed to each member of the Academy. Members are urged to read it carefully, particularly the articles mentioned above.

Field Work

Dr. Orlando Park, honorary curator of zöology, Thurston I. Wright, and Dr. H. K. Gloyd made several local field trips during May to collect specimens for the Academy and for Northwestern University. Additional field work of a similar nature is planned for September.

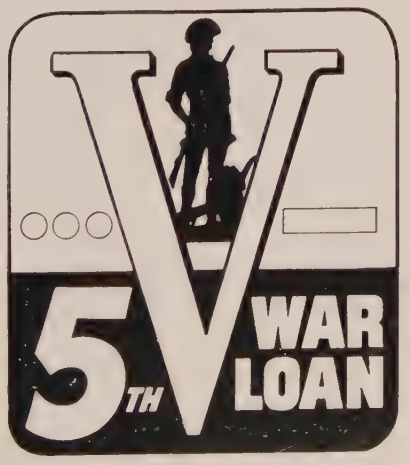
Dr. Gloyd expects to leave shortly for southern Arizona to collect herpetological specimens and make motion pictures of desert wildlife. He will return to the Boyce Thompson Southwestern Arboretum near Superior, the headquarters of the field party sponsored for the Academy by James R. Offield and John Y. Beaty in 1940.* He will be joined by W. A. Bevan of Long Beach, California, an experienced field worker. Mr. Bevan has collaborated with Dr. Gloyd for many years and assisted him in Arizona last season.

*See Chicago Nat., vol. 3, p. 67-78, 111-124.

Sound Equipment Contributors

Members of the Academy responded most generously to an appeal for contributions toward the installation of sound equipment in the auditorium. The purchases made possible by this fund were reported in the last issue of *The Chicago Naturalist*, and a new member, John E. Thompson, has since donated a crystal high-impedance microphone.

Contributions to this fund were made by M. J. Ballestro, John E. Coe, Miss Flora Cooke, Mrs. Joseph M. Cudahy, H. DeLemon, F. R. Dickinson, T. E. Donnelley, Paul Downing, Miss Louise Fairman, A. E. Freer, E. H. Garnett, F. Gehrman, A. K. Gonnerman, L. P. Hendiard, Dr. M. M. Leighton, M. D. Malay, Quin Morrison, J. R. Offield, Mrs. L. Pearse, Hopewell L. Rogers, Miss Ethel Schierbaum, E. H. Schmidt, C. O. Schneider, Mrs. Paul Starrett, Dr. R. M. Strong, C. H. Sudler, John E. Thompson, H. S. Ullman, Alton S. Windsor, C. O. Whaley, and Robert C. Wheeler.



The Naturalist's Book Shelf

Man's Physical Universe

By Arthur Talbot Bawden

The MacMilian Co., New York, 1943, revised edition, xv, 832 pages, 321 text figures, bibliography, index. $4.00.

The author places before students and teachers—courageously, it is thought—another text-book for a survey course in physical science. The task requires courage because books of this general nature, written and published during the last few years, are not few in number. One of the strongest recommendations for the volume, however, is that it is a revision of the first edition, published in 1937. This mere fact guarantees that the book has obvious merits and has stood the tests of teachers' scrutiny and students' use over a period of at least five years.

The casual but careful reader is impressed at once by the spirit which prevades the pages. The author has entered most whole-heartedly into the task of teaching. He considers the problem inevitably to be faced by the hard-worked teacher and says (page vii, preface) "I shall be glad to offer suggestions concerning the selection of Units and Sections (for assignments) for shorter courses to teachers who send for such suggestions." When one considers all that such an offer may lead the auther into, one is thoroughly convinced of his sincere hopes concerning the successful teaching of the contents of the books.

The author's concern for the welfare of students is reflected in the conclusion to the volume (pages 802-804). In these pages he writes as one might speak from the class-room platform. He points out clearly that study is a process that shapes one's life; not, merely, the performance of a task. ". . . . your grade depends, not on what you have done, but on what you *will* do as a result of taking this course."

Astronomy, geology, physics, and chemistry are among the fields in science considered in the book. An embellishment of each class-room subject treated is the development of information concerning the practical application in each, and from each, of the fields through research. Beneficial results to the individual, he stresses, likewise may be obtained through the cultivation, personally, of the scientific method.

Reproduced photographs, some of them not sufficiently clear, line-drawings, tables and formulae cluster the pages. Typography is good, the text is amply and conveniently divided into short, connected paragraphs under appropriate black-type headings. A couple of dozen or more questions pertinently phrased to stimulate the mind of the student are appended to each numbered "Unit" in the text, that word filling the place of "Chapter" as commonly used in text-books.

John R. Ball

A Treasury of Science

Edited by Harlow Shapley with Samuel Rapport and Helen Wright

Harper and Brothers, New York and London, 1943, ix, 712 pages, bibliography, no illustrations. Cloth, $3.95.

Dr. Shapley and his associate editors have compiled a panoramic volume of excerpts from scientific literature in the English language. The selections are not just scattered samplings but are so arranged as to tell a consecutive story of man's exploration of the universe in the words of the foremost scientific writers in each of the fields of investigation—astronomy, physics, chemistry, zoology, anthropology, psychology, and medicine.

Several pages of introductory information furnish a background for each of the five major Parts of the book: a charming and stimulating *Introduction* by Harlow Shapley (On Sharing the Conquests of Science); *Science and the Scientist*; *The Physical World* (The Heavens, The Earth, Matter, Energy, Physical Law); *The World of Life* (The Riddle, the Spectacle, and the Evolution of Life); *The World of Man* (From Ape to Civilization, The Human Machine, The Conquest of Disease, Man's Mind, Man's Future). Authors range from Galileo, Copernicus, Benjamin Franklin, Newton, and Darwin to the Huxleys, Keith, Jeans, Eve Curie, Kaempffert, de Kruif, Beebe, Peattie, Heiser, and Hooton.

The editors state, "In making our selection (from several thousand books and articles) we have tried to emphasize especially the status of the contributions of modern science, to the end that the reader can bring himself abreast of the current progress. . . . . A contribution toward the integration of science is . . . . one goal of this volume."

Harriet M. Smith

Shrubs of Michigan

By Cecil Billington

Cranbrook Institute of Science Bulletin No. 20, Bloomfield Hills, Mich., 1943, 249 pages, illus., 161 figs., maps, glossary, index. $2.50.

Prepared primarily for use by amateur naturalists, *Shrubs of Michigan* will be applauded as well by professional botanists throughout the Midwest.

Mr. Billington has been an enthusiastic botanist for over 20 years, and it is not surprising that his keen interest has been reflected in this splendid handbook.

Well-excuted format and carefully planned and prepared text make this manual particularly useful to the beginner. Following the introductory discussion on shrubs are a pictorial glossary and keys to the identification of the genera, both of which will help in making the taxonomic descriptive listing of the species more intelligible to the amateur. Each botanical description is accompanied by a distribution map and usually a line drawing of the species. A bibliography and glossary further enhance the usefulness of the volume for the beginner.

Kathryn J. Stephenson

Ancient Man In North America

By H. M. Wormington

Popular Series No. 4, Colorado Museum of Natural History, Second (Revised) Edition, May 15, 1944. 89 pages, glossary, bibliography, illustrated with photos and drawings. 35c

It is most appropriate that correlation of the findings from widely scattered investigations and summaries of progress in the study of man's antiquity in North America should be published by the Colorado Museum of Natural History, for the first scientifically recorded and accepted find of early man in the New World was made in 1926 at Folsom, New Mexico by a paleontology expedition of this institution. The booklet, *Ancient Man in North America* by H. M. Wormington, was published in 1939 and has just been revised in the light of additional discoveries during the past five years. It is hoped that similar revisions and amplifications of "Popular Series No. 4" will appear at suitable intervals, for the scientific literature, mostly in professional publications of limited distribution, is piling up so rapidly in this relatively new field that the great value—not only to the scientifically inclined layman but the professional archaeologist—of a non-technical but fully documented summary is increasingly apparent.

This excellent booklet realizes its avowed purpose: "first, to give a brief survey in as comprehensive a form as possible, seeking to show accomplishment as well as to point out the many gaps in our knowledge which still exist; second, to present the subject in a manner that

may be acceptable to the intelligent layman with an interest in archaeology." A glossary explains the meaning of those technical terms whose use is unavoidable and superscript numbers in the text identify the technical papers used as source material.

The 1944 edition has two more pages of glossary (seven as compared with five), seven more of text, and cites twelve new publications, bringing the bibliography up to a total of 104 titles. Greatest amplification is found in the sections on ancient plains hunting complexes (particularly in the Yuma stone technology on which Wormington is an authority) and the concommitant Southwest food-gathering complex (Cochise). Under "Time Estimates," a very tentative (and at that time broad-minded) statement in the 1939 edition—" . . . but there is not sufficient evidence at the present time to warrant assigning a greater age to man in America than late-Glacial or early post-Glacial"—has been revised by 1944, on the basis of new geological as well as archaeological evidence, with the recognition of at least two more periods during the Wisconsin glacial epoch when migration through the Canadian Planes was possible climatologically. Mr. Wormington expresses the relief of archaeologists at this relaxing of geological time barriers when he writes: "With the new discoveries of a variety of cultures of considerable antiquity, geographically remote from any possible migration route, it seems almost certain that migration from the Old World to the New must have been possible at an earlier date than had previously been believed. The theory of an amelioration of climate between the main substages of of the Wisconsin seems to be entirely tenable and makes it possible to understand phenomena which would be unexplainable if one believed that migration was possible only after the withdrawal of the ice had begun."

Harriet M. Smith

Handbook of Salamanders

The Salamanders of the United States, of Canada, and of Lower California
By Sherman C. Bishop
Comstock Publishing Co., Inc., Ithaca, N.Y., 1943, xiv, 555 pages, colored frontispiece, 144 figures, bibliography, index. $5.00.

The study of salamanders has long been difficult for both amateur and professional naturalists in large part because there has been no general reference book dealing with this relatively little-known group of amphibians since Cope's *Batrachia of North America* published in 1889, a book now rare and difficult to obtain. The technical literature relating to salamanders, while by no means scanty, is scattered through many scientific journals and museum papers and generally difficult of access to anyone not within reach of a large library. The present volume, by one of our foremost authorities, brings together in systematic arrangement, a summary of present knowledge of structure, coloration, habits, variation, and geographic distribution of the salamanders of North America exclusive of the mainland of Mexico.

The introduction lists the seven families with their respective numbers of species and subspecies regarded as valid by the author (a total of 126), describes the habits of salamanders in general, gives suggestions for collecting and preserving specimens, an explanation of the use of keys, and comments on the maps indicating geographic ranges. The accounts of species begin with a key to families (based on adults) and continue with a systematic treatment of families, genera, species, and subspecies. There are keys to the genera of Ambystomidae, Plethodontidae, and Sirenidae, and keys to the species and subspecies of each nonmonotypic genus. A bibliography of 67 pages first lists general works (93 titles), checklists and catalogs (10 titles), papers on life history and habits (47 titles), and popular works (13 titles); then follows

66 pages of references arranged by states and provinces. Both the author and publisher deserve the serious student's gratitude for this generosity. The index includes both scientific and vernacular names. There is no glossary but technical terms are sparingly used and only a few will be troublesome to a beginner.

An excellent color plate of the Texas newt is the frontispiece and each species or subpecies is illustrated by one or more halftones from unusually satisfactory photographs. There are also numerous line drawings showing structural characters of diagnostic value. The known geographic distribution of each form is shown on maps (56 in all) by various schemes of shading or hatching.

This book should be in the library of every naturalist at all interested in the cold-blooded vertebrates. It will aid and stimulate the study of salamanders for many years to come.

H. K. Gloyd

Mankind So Far

By William W. Howells

Vol. 5, American Museum of Natural History Science Series, Doubleday, Doran and Company, Inc., Garden City, N. Y., 1944, xii, 319 pages, 7 half-tones and numerous line-cut illustrations, index. $4.50.

The three parts of this book develop man's story with logical continuity from his general biological background—his place on the vertebrate family tree—through fossil apes and men (this section is particularly valuable in that it brings together and correlates information on recent finds), to the modern racial differentiations of the only surviving species of man, *Homo sapiens*.

Dr. Howells, research associate at the American Museum of Natural History and assistant professor of anthropology at the University of Wisconsin, is well qualified to tell this story. His careful compilation of factual information and authoritative interpretations make the book of text-book caliber, but it would be wholly unfair to classify it in that forbidding category. Highly readable, non-technical—indeed, conversational—in vocabulary and style, *Mankind So Far* may be classed as popular scientific writing in the best sense of this much abused term. It helps the reader to regard his own species with a more accurate perspective and a hopeful outlook for the long-term future and is an entertaining, stimulating contribution toward the better understanding of present-day race and nationality problems.

Excerpts from the first chapter indicate Dr. Howells' approach—friendly, human, yet objective: "Of all animals, we men are the only ones who wonder where we came from or where we will go. The future is the more awesome prospect. . . . but we can take a calmer view of the past, because it is water over the dam. . . . . That part of man's history which he can properly call his own is short indeed, and, the further back we follow him the more widely does he share his ancestors with other living species." Viewed as a matter of history man's arrival "looks more like a foregone conclusion than a providential afterthought," for, while "man may represent the high water mark of evolution at the present day, he fits readily enough into the great framework of natural history and that is how he should be judged."

Harriet M. Smith

All books reviewed in *The Chicago Naturalist* are placed in the Reading Room at the Academy, where they are readily available to all who may care to read them or inspect one before placing an order with the publisher.

Reading Room hours are from 2 to 5 P. M. on week days and 9 A. M. to 5 P. M. on Saturdays.

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announces the publication of

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By

VERNE O. GRAHAM, PH. D.

Honorary Curator of Mycology
Chicago Academy of Sciences

A manual of the fleshy, leathery and woody fungi of Illinois, Indiana, Ohio, and the southern half of Wisconsin and of Michigan.

For the amateur as well as the professional naturalist, this book is intended to furnish means for identifying the species of Ascomycetes and Basidiomycetes of the area covered. A key to genera is followed by a systematic treatment of more than 1200 species. There are keys to the species of all larger genera. Each species is characterized briefly and its habitat and geographic range stated. *Those of known edibility are indicated.* Descriptive terms are defined in a glossary and scientific names, including synonyms, are indexed.

The illustrations, 868 figures in 49 plates, were carefully drawn under the supervision of the author and handsomely printed by collotype.

Published jointly by the Academy and the Chicago Natural History Museum (formerly Field Museum), vii + 390 pages, 49 plates, paper cover, June, 1944. Price $4.10 postpaid in U. S.

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